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PAPERS ON CEREAL AND FORAGE INSECTS.

THE SMOKY CRANE-FLY.

BY

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Agent and Expert.

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PAPERS ON CEREAL AND FORAGE INSECTS.

THE SMOKY CRANE-FLY.

(*Tipula infuscata* Loew.)

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INTRODUCTION.

The maggots or larvæ of the Tipulidæ are known in the several parts of this country by many local names, among which, perhaps, the most generally applied are "meadow-maggots," "leather-jackets," "grubs," and "cutworms." The last name has proved most unfortunate, leading to great confusion in Departmental and station correspondence, and has arisen from a mistaken, though very prevalent, impression among farmers that these larvæ are the same as the true cutworms, and that in late spring when the weather conditions are favorable the so-called "cutworms" come to the surface of the ground where they "burst" from exposure to the sun's rays. The larvæ, for it is in the larval stage of development exclusively that these insects are of economic importance to the farmer, are really the young of several species of crane-flies—also known as "gallinippers," "giant mosquitoes," and "daddy-long-legs." The last name, however, is sometimes applied to the eight-legged and wingless harvest spiders (Phalangidæ).

A comprehensive economic treatment of this family of insects, as such, is impossible at the present time, owing to the necessarily fragmentary condition of our knowledge of the early stages of most of the species and the great diversity of habits exhibited by those which have been studied. In mode of living they range from the aquatic

Note.—The author wishes to acknowledge the assistance, received in preparing this paper, of Messrs. Nathan Banks, Frederick Knab, and D. W. Coquillett, who critically reviewed the technical descriptions, and of Mr. R. E. Snodgrass, who prepared the anatomical drawings of the larval head. The other illustrations were prepared by Mr. J. F. Strauss and the author.

forms such as *Limnophila lutcipennis* O. S., *Helobia punctipennis* Meig., *Erioptera graphica* O. S. (C. A. Hart, 1895), and *Tipula abdominalis* Say, through the semiaquatic forms, of which *Holorusia rubiginosa* Loew (V. L. Kellogg, 1901) is an example, to the distinctly terrestrial forms among which are several species of Tipula and most of the species of *Pachyrhina*, so far as the latter have been studied. In seasonal development they range from *Tipula virgo* O. S., *T. eluta* Loew, *Pachyrhina ferruginea* Fab. and *P. macrocera* Say, which are flying about in March and April; through *Tipula spernax* O. S. and *T. angustipennis* Loew, which appear in May; most of the species of *Pachyrhina*, so far as studied, *Tipula fuliginosa* Say, *T. trivittata* Say, *T. tephrocephala* Loew, *T. bicornis* Loew, and *T. graphica* Doane, abroad in early June; *Tipula grata* Loew, *T. angulata* Loew, and *T. tricolor* Fab., in July; *Pachyrhina sodalis* Loew, a probable second brood of *P. ferruginea* Fab., *Tipula hebes* Loew, *T. abdominalis* Say, *T. costalis* Say, *T. macrolabis* Loew, *T. valida* Loew, and the second brood of *T. bicornis* Loew, in August and September; and last to *Tipula flavicans* Fab. and *T. infuscata* Loew, which appear in October.

Among the observations on these insects in relation to agriculture in the United States might be mentioned an article by Dr. T. W. Harris (1854), in which he records receiving a bottle of tipulid larvæ with a letter stating that they were found alive in great numbers on the snow in March. Dr. C. V. Riley (1867) briefly mentions them as of economic importance. Dr. B. D. Walsh (1869) refers to a letter from a farmer at Mexico, Mo., who complains of these larvæ in his garden and who notes that they stand freezing with impunity. Doctor Riley (1870) published a letter from a correspondent at Meadville, Pa., in which he records finding these larvæ in great numbers under mulch hay. Dr. S. A. Forbes (1888) reports a very general and serious outbreak of tipulids (*Tipula bicornis* Loew) in grass and clover meadows throughout southern and central Illinois, many pastures and hayfields being almost completely ruined. He also published a letter from Doctor Riley (1888) in which the latter reports a very similar outbreak in California in 1874. In an unsigned article in the Pacific Rural Press for March 29, 1889, record is made of an outbreak in Healdsburg, Cal., specimens having been received at the state agricultural experiment station with the note that they were completely stripping the wheat fields. Prof. F. M. Webster (1892) records a bad outbreak of tipulids (*Tipula bicornis*) in Anderson, Ind., in 1888, the larvæ attacking clover. He also records an attack of *Pachyrhina* sp. on young wheat near Farmersburg, Ind.

On April 2, 1908, a number of tipulid larvæ were received at this office from Mount Vernon, Ind., with the note that they were very numerous in hay meadows in that locality. Mr. R. W. Doane, in a

letter to this office, records a very serious outbreak of Tipulidæ (*Tipula simplex* Doane) in central California during the season of 1907, and states that thousands of acres of wheat and grass lands and clover fields were absolutely stripped of verdure.

In Europe *Tipula oleracea* L. and other species have long been recognized as important pests.

DESCRIPTION.

THE ADULT.

The species was originally described by Loew (1863) from a single female specimen. The original description, translated by the author, is as follows:

Gray, thoracic stripes brownish gray, darkly margined, median stripe imperfectly divided; abdomen darkly testaceous, median line clouded, posterior margin of each segment, all of the last segments, and the base of the ovipositor brownish gray, opaque; wings uniformly faintly clouded, the apex of the same color, costal cell and stigma clouded. Length of body 7½ lines, length of wings from 7½ to 7¾ lines. Head gray, rostrum reddish brown, becoming gray above, palpi dark yellow, apex nearly black. First antennal segment reddish brown, grayish, second segment red, flagellum black, basal segment red. Dorsum of thorax gray, stripes brownish gray and more darkly margined, median stripe imperfectly divided. Pleura whitish gray. Abdomen dark testaceous, posterior margin of each segment, all of last segments, lateral margin, and base of ovipositor grayish brown, opaque, narrow median stripe fuscus. Lamellæ of the ovipositor rufotestaceous, the upper ones pointed and slightly curved inward. Wings faintly clouded, apex of the same color, first basal cell and stigma brown.

Note.—Very close to *Tipula helva*, except that the whole body is darker and the wings are more evenly colored.

In addition to the original description the author desires to add the following:

Female (fig. 60).—Ovipositor consisting of 4 external, brown, chitinous plates and a semichitinous yellow lingulaform appendage. Upper plates one-third longer than lower ones, sword-shaped, slightly flexed ventrad; on inner surface of fused upper plates a hemispherical, bilobed, membranous cushion closely set with fine hairs; lower plates truncate and nearly concealed by upper plates when insect is at rest; inner surface of each lower plate with several hairs; lingulaform appendage triangularly grooved dorsally, and quite hairy. Length of body, 18 mm.; wing, 15.5 mm. (measurements made from dried specimens).

Male (fig. 61).—General color of head and thorax brownish gray, abdomen and legs yellow, eyes black, rostrum yellowish brown below and pale yellowish gray above, palpi clouded; scape of antennæ yellowish gray, distal half of joint 3 and remaining joints brown. Thorax marked with a light-gray median line which is distinct anteriorly but fades out about half way to the V-shaped suture; a light-gray margin around the anterior border of the mesothorax, widening to triangular patches at the spiracles, and 2 longitudinal lines parallel to the median line, arising at the apices of the triangular patches and extending backward to the V-shaped suture; pleura and coxæ whitish gray; femora light yellow, densely clothed with short black hairs; tibia and tarsi darker and clothed with short black hairs. Abdomen with narrow ventral,

a narrow lateral, and a broad dorsal brown stripe. Wings evenly clouded, the veins, marginal cell, and stigma brown. Hypopygium globular, though not conspicuously broader than preceding segments; pleural suture distinct at its distal end, although obliterated proximally; middle apical appendages each bearing a stout black hook which curves inward, upward, and forward; upper apical appendages consisting of sparsely hairy, quadrate, yellow flaps which are rolled upward, inward, and then downward; lower apical appendages

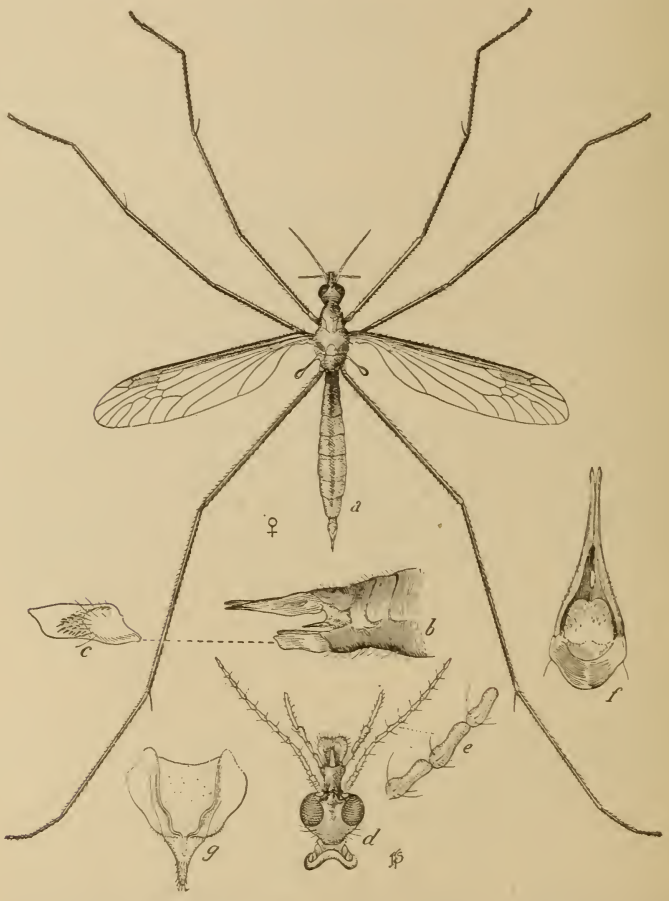

FIG. 60.—The crane-fly (*Tipula infuscata*): *a*, Adult female; *b*, ovipositor, lateral aspect; *c*, lower genital plate, inside surface; *d*, head, dorsal aspect; *e*, antennal joints; *f*, ovipositor, ventral aspect, with lower plates removed; *g*, lengulaform appendage of same. About natural size. (Original.)

consisting of heavy, convex, triangular pieces bearing several hairs. A small semichitinous flap is situated directly above the ventral carina. Two prominent blunt teeth arm the dorsum of the ninth segment. Length of body, 13.5 mm.; wing, 14 mm. (measurements made from dried specimens).

THE EGG.

Egg (fig. 62) shiny black, elongate oval, one end being slightly conoidal; a distinct round pit on one side near conoid end. Length, 884μ; width, 245μ.

THE LARVA.

Larva (fig. 63, *a*) filiform, 19 mm. in length and 3 mm. in diameter at its widest point when fully extended. General color dirty yellowish brown, dark-

FIG. 61.—The smoky crane-fly: *a*, *b*, Adult male; *c*, thorax and head, lateral aspect; *d*, antennal joints I–IV; *e*, tarsal joint and ungues; *f*, pygidial segments, terminal aspect; *g*, end of abdomen, lateral aspect. *a*, natural size; *b*, enlarged; *c–g*, much enlarged. (Original.)

ening to almost black at the extremities. Body composed of 13 segments, the head being about two-thirds incased in the first and entirely retractile within the first two segments. Posterior segment (fig. 63, *k*) terminated by 4 blunt, radially arranged tubercles, between which are 2 large black spiracles; when contracted the 4 tubercles completely conceal the spiracles; on ventral surface of this segment are 4 large and 2 smaller radially arranged pseudopods, posterior to which is the anus (fig. 63, *i*).

FIG. 62.—The smoky crane-fly: Eggs. Highly magnified. (Original.)

Head (fig. 63, *c*, *e*) partly chitinized, 2.1 mm. in length and 1.4 mm. in width. Genal region extending backward from the mandibles and maxillæ as two strongly convex plates, deeply pigmented on their anterior half and fading out to transparent chitin on their posterior margins. These plates are widely separated postero-ventrally to form the pharyngeal foramen; antero-ventrally they are continuous with the mentum. Dorsally they appear to

approximate each other, owing to 2 posteriorly directed, narrow lobes, leaving between them a narrow, dorsal, median, semitransparent area which widens an-

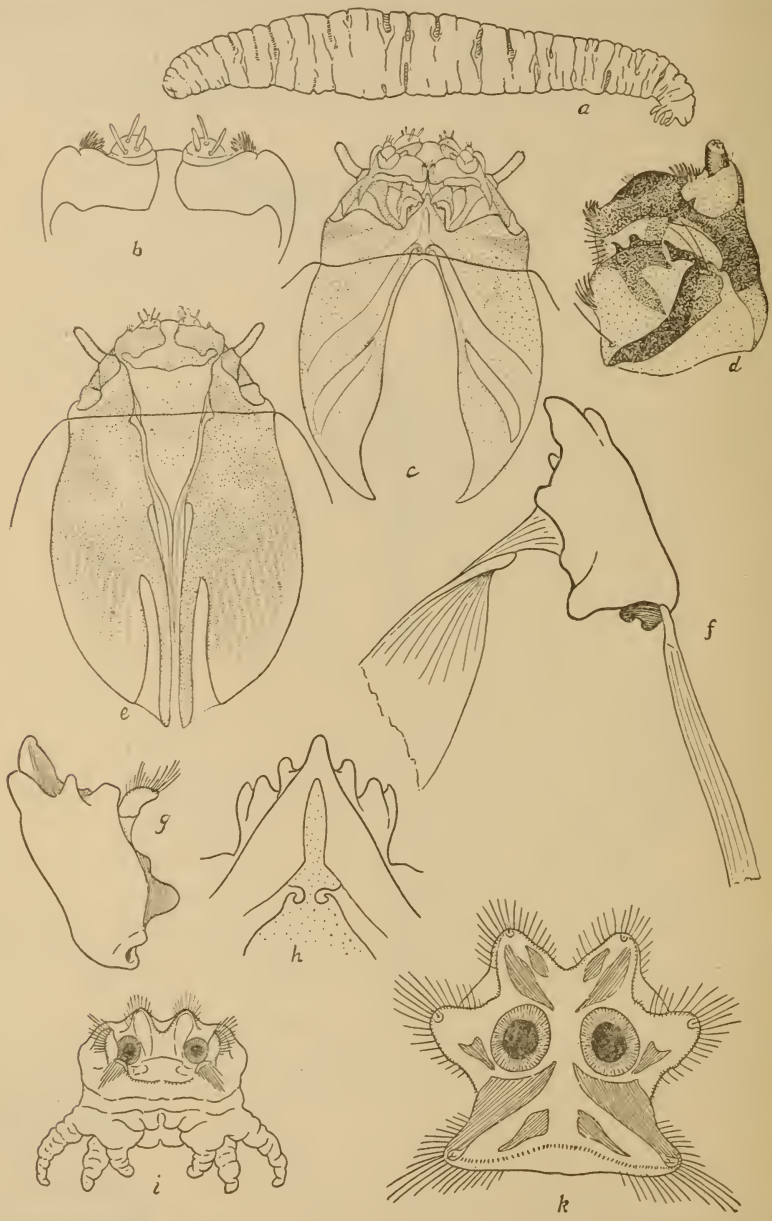

FIG. 63.—The smoky crane-fly: *a*, Larva, left side; *b*, clypeo-labral part of head, dorsal aspect; *c*, ventral aspect of head, showing also position of front edge of prothorax; *d*, maxilla; *e*, dorsal view of head; *f*, left mandible and its muscle apodemes, ventral aspect; *g*, left mandible, dorsal aspect; *h*, mental lobes of ventral wall of head; *i*, anal segment, terminal aspect; *k*, same, dorsal aspect. *a*, Enlarged; *b–k*, more enlarged. (Original.)

teriorly to receive the fused frons, clypeus, and labrum. Postero-ventrally the gular region seems to be separated from the occipital region by a transparent

area extending from the pharyngeal foramen dorsally and posteriorly about one-third of the distance to the vertex. Mentum (fig. 63, *h*) terminated by a median blunt lobe supported on each side by a smaller lobe and two partly fused lobes; a nonchitinized, transparent area extends from the pharyngeal foramen into the apex of this organ, this area separated from the foramen proper by a pair of posteriorly directed, blunt lobes of the gular region. Labrum bearing on its dorsal surface a pair of broad protuberances (fig. 63, *b*) each surmounted externally with a brush of fine hairs and internally with a rounded tubercle bearing 3 peculiarly formed bristles. Antennæ single jointed, cylindrical, about one-fourth as wide as long, situated above the mandibles; basal tubercle truncate, about one-half length of antennæ. Mandibles (fig. 63, *f*, *g*) stout, the crown concave and provided with 2 large external teeth and a smaller dorsal internal one. Maxillæ (fig. 63, *d*) quadrate, each being provided with 2 anterior and 1 lateral tuft of hairs and a short truncate cylindrical palpus. Body integument attached to head capsule at a line passing around head directly behind mandibles. Thoracic and abdominal segments, except anal segment, without external appendages or vestiture of any kind. Circumstigmal tubercles armed on their inner borders with a row of very short spines supported by a row of fine hairs.

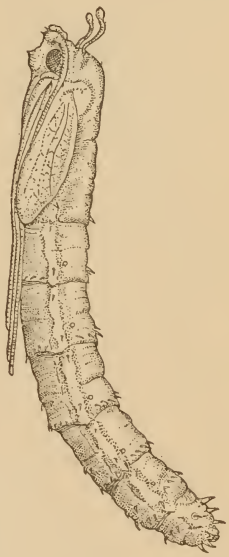

FIG. 64.—The smoky crane-fly: Pupa, lateral aspect. Enlarged. (Original.)

THE PUPA.

Pupa (fig. 64) cylindrical, slightly sinuate in profile, 19 mm. in length and 2 mm. in diameter. Cases containing wings, antennæ, and legs free and lying appressed to venter. General color yellowish brown, the head, wings, antennæ, legs, and thoracic respiratory tubes dark brown. A light yellow stripe bordered by a fuscous line on either side, situated directly ventral to the spiracles, extends from tip of wings to base of anal segment. The fuscous line dorsal to this stripe is continuous with a wide fuscous band along the anterior margin of each segment dorsally, and also with a narrow line defining each annulus. The band is very conspicuous on the fifth segment but rather faint on the others.

Head well defined; eyes prominent. On ventral surface directly between eyes is a prominent tubercle surmounted by a spine. Anterior to this spine and between the antennal fossæ are 2 more spines.

Pronotum bearing a pair of strongly clubbed and distinctly annulated respiratory tubes which are directed anteriorly with the clubs inclined slightly ventrad. Wings extending from a short distance behind eyes to base of first abdominal segment. Third pair of legs extending to base of third segment of abdomen.

Abdomen composed of 6 segments, although, owing to annular constrictions on the first 5 segments, appearing to have 11. Each segment, except anal, provided ventrally with a transverse row of 8 short, marginal spines, and 2 larger and more widely separated spines near anterior margin; segments provided dorsally with a similar transverse row of 10 short marginal spines arranged in groups; the two groups nearest median line consisting of 2 spines each and the groups nearest stigmata with 3 spines each. Dorsal surface of segments directly anterior to this transverse row of spines and posterior to the annulus finely

hairy. Tergum of anal segment bearing 3 pairs of transversely placed, acutely conoida tubercles; one pair, the tubercles of which are placed near together, situated near middle; a second pair, widely separated and posterior to the first, and a third pair directed caudad, not so widely separated as the second, located at posterior marginal angles. Directly ventrad to the third pair of tergal tubercles is a subquadrate lobe bearing at its outer angles a pair of stout tubercles. A median emargination on the posterior border is continuous with a median groove to the tergum. On each side of this median groove and directly below the terminal pair of tergal tubercles are 2 conchate cavities, probably stigmal in function.

LIFE HISTORY.

On March 20, 1908, a number of tipulid larvæ (*Tipula infuscata*) were sent to this office by Mr. E. W. Lawrence, of Jackson, Tenn., with the statement that they were completely destroying Japan clover (*Lespedeza striata*) in the tenth district of Madison County, and this paper deals exclusively with our subsequent investigations of this particular species.

Early in October the adults (figs. 60, 61) of this species are abroad in great numbers among tall, rank grass, clover, and weeds, from which they rise awkwardly, as one approaches, flying but a few yards before alighting. They continue abundant in the field during the greater part of October, belated individuals being found about Washington, D. C., as late as October 30.

From material received from Jackson, Tenn., the first adults appeared on October 5, 1 male and 3 females emerging. These females mated almost immediately after emerging, but died without ovipositing. On October 20 a female that emerged on October 13, and that had remained mated for over sixteen hours, began ovipositing on the slate bottom of the rearing cage. She would deposit three or four eggs in a given place and then move on excitedly an inch or more and repeat the process. On being placed in a pot of earth she seemed more at home, elevating her body on the long legs, holding the abdomen perpendicular to the surface of the ground, then slowly moving forward, bobbing up and down, and apparently feeling the ground with the tip of her ovipositor until she found a crevice or hole, when she would let her abdomen into the cavity, deposit a few eggs, and move on to repeat the process at the next crevice encountered. That the Tipulidæ normally flip the eggs about while flying seems very doubtful, but under adverse circumstances, such as being caught in spiders' webs, as one often sees them, they undoubtedly use this means, though probably not intentionally, of dispersing their eggs. A specimen of this species etherized for examination threw out 176 eggs by sudden sidewise movements of the upper and lower genital plates, much as one would snap the fingers. One egg was thrown to a distance of 10 inches.

The average number of eggs laid by one female of this species, as determined by confining recently fertilized females in separate rear-

ing cages and by dissecting the abdomens of females that had just emerged, was approximately 300. This number had also been found to be about the egg-laying capacity of *Tipula bicornis*, as from three specimens Prof. F. M. Webster (1892) obtained 297, 282, and 289 eggs, respectively; and also of *Tipula tephrocephala*, from the abdomen of a female of which 255 eggs were obtained. A specimen of *Tipula angustipennis* which the writer collected at Pullman, Wash., however, contained 602 eggs, and Mr. E. O. G. Kelly found that a confined specimen of an undetermined Tipula from Kansas laid 417 eggs. The eggs laid in our rearing cages failed to hatch, but from the notes made by Mr. E. O. G. Kelly on the egg stage of an undetermined species in Kansas they probably hatch in from one to three weeks.

The larvæ (fig. 63, *a*), which often occur in enormous numbers, as many as 200 having been found in an area covering a little over 1 square foot, feed upon the roots of various plants, seeming to prefer the Leguminosæ, and, contrary to most published accounts of the habits of these larvæ, they not only suck the juices of the roots but devour the plant tissue itself, as is evidenced by the stomach contents of several larvæ examined in this office. Moreover, the well-developed biting mandibles would indicate a tissue feeding habit. They feed during the early fall and hibernate as half-grown larvæ, resuming activities in the spring. In feeding, these larvæ move about in the ground quite freely, as is evidenced by the small molehill-like ridges which they leave, in going from plant to plant just under the surface of the ground. They become full grown about the middle of July, form perpendicular cells about 3 or 4 inches underground, and remain inactive until about the middle of September, when they pupate. The pupal stage lasts from a week to ten days. The pupa (fig. 64)

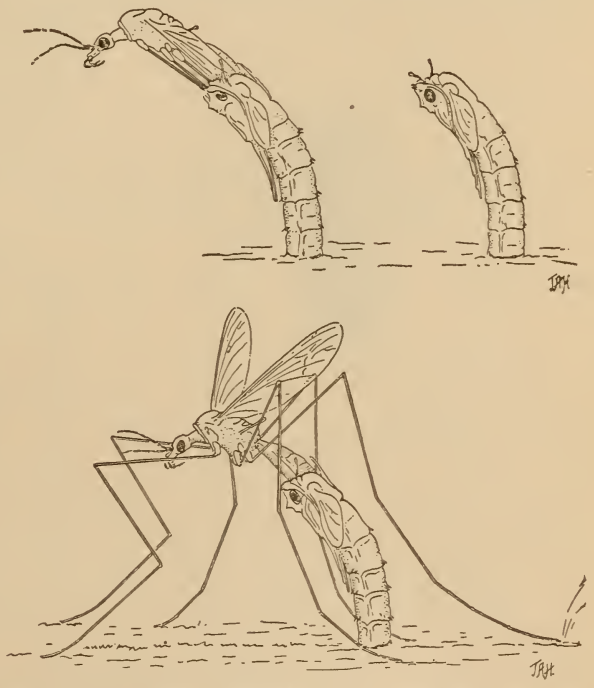

FIG. 65.—The smoky crane-fly: Adult, emerging from pupal case. Enlarged. (Original.)

then, by means of the abdominal spines, works its way to the surface, from which it protrudes about two-thirds of its entire length (fig. 65). By swaying backward and forward the rapidly drying pupal skin is soon split across the back of the head and down the dorsum of the thorax. The swaying movement now serves to work the adult out until the legs are freed, when with their aid it rapidly extricates itself. The males usually appear first and are swarming in the fields when the females emerge, so that the latter are mated when their wings are hardly dry. In Pullman, Wash., the writer observed a small cloud of Tipulidæ (*Dicranomyia venusta* Bergr.) on April 27, 1909, hovering under the eaves of the government field insectary. Other similar observations have been made on other species and C. N. Ainslie (1907) noted that with *Trichocera bimacula* Walk. this was a mating process.

FIG. 66.—*Admontia pergandei*, a parasite of *Tipula infuscata*. Enlarged. (Original.)

NATURAL ENEMIES.

PARASITES.

Among insect parasites but one is known to attack this species or, as far as the writer knows, any other tipulid in this country. It is a small tachinid fly, *Admontia pergandei* (fig. 66), described by Mr. D. W. Coquillett in 1895. These parasites were first noticed in the rearing cages in which the Tipula larvæ were confined, on October 7, when 4 specimens emerged. Within the next week 15 more specimens were taken from this cage. This genus is recorded as parasitic on Tipulidæ in Europe, but heretofore has not been recorded as such in this country. A female of this tachinid was dissected and found to contain 103 elongate-elliptical white eggs measuring 0.564 mm. in length and 0.146 mm. in diameter.

OTHER INSECT FOES.

Prof. F. M. Webster records the carabid beetles *Pterostichus lucublandus* Say and *P. femoralis* Kirby as probably predaceous on these tipulids. He also records (1888) the larvæ of *Harpalus* sp. and *Platynus* sp. as preying on the larvæ and pupæ of Tipulidæ at Anderson, Ind., and the ant *Aphænogaster fulva* Roger as found in the act of dragging a living adult tipulid over the ground.

The larvæ of *Trombidium* sp. and *Rhyncholophus* sp. are often found attached to the base of the wings and abdomen of tipulids.

BIRDS.

Among the birds which are known to feed upon the Tipulidæ, either as eggs, larvæ, or adults, probably the most important are the wood thrush (*Hylocichla mustelina*), the Alice thrush (*Hylocichla aliciæ*), the catbird (*Dumetella carolinensis*), the robin (*Planesticus migratorius*), and the crow (*Corvus brachyrhynchos*). Of the total stomach contents of 22 specimens of the wood thrush, examined at the Illinois State Laboratory of Natural History, 12 per cent was made up of tipulid fragments, while 11 specimens of the Alice thrush contained 8 per cent of tipulid fragments.

The following species also, according to the records of the Bureau of Biological Survey, are known to feed to a greater or less extent on Tipulidæ or their eggs:

Franklin gull (*Larus franklini*).
Woodcock (*Philohela minor*).
Wilson snipe (*Gallinago delicata*).
Killdeer (*Oxyechus vociferus*).
Ruffed grouse (*Bonasa umbellus*).
Mississippi kite (*Ictinia mississippiensis*).
Yellow-billed cuckoo (*Coccyzus americanus*).
Black-billed cuckoo (*Coccyzus erythrophthalmus*).
Kamchatkan cuckoo (*Cuculus canorus telephonus*).
Downy woodpecker (*Dryobates pubescens*).
Yellow-bellied sapsucker (*Sphyrapicus varius*).
Red-headed woodpecker (*Melanerpes erythrocephalus*).
Flicker (*Colaptes auratus*).
Texan nighthawk (*Chordeiles acutipennis texensis*).
Nighthawk (*Chordeiles virginianus*).
Kingbird (*Tyrannus tyrannus*).
Arkansas kingbird (*Tyrannus verticalis*).
Crested flycatcher (*Myiarchus crinitus*).
Black phœbe (*Sayornis nigricans*).
Phœbe (*Sayornis phœbe*).
Say phœbe (*Sayornis sayus*).
Wood pewee (*Myiochanes virens*).
Western wood pewee (*Myiochanes richardsoni*).
Western flycatcher (*Empidonax difficilis*).
Yellow-bellied flycatcher (*Empidonax flaviventris*).
Least flycatcher (*Empidonax minimus*).
Traill flycatcher (*Empidonax trailli*).
Acadian flycatcher (*Empidonax virescens*).
Wright flycatcher (*Empidonax wrighti*).
Blue jay (*Cyanocitta cristata*).
Steller jay (*Cyanocitta stelleri*).
Bobolink (*Dolichonyx oryzivorus*).
Yellow-headed blackbird (*Xanthocephalus xanthocephalus*).
Red-winged blackbird (*Agelaius phœniceus*).
Bicolored red-winged blackbird (*Agelaius gubernator*).
Meadowlark (*Sturnella magna*).
Bullock oriole (*Icterus bullocki*).
Baltimore oriole (*Icterus galbula*).
Brewer blackbird (*Euphagus cyanocephalus*).
Purple grackle (*Quiscalus quiscula*).
Aleutian rosy finch (*Leucosticte griseonucha*).
Snowflake (*Passerina nivalis*).
Aleutian savanna sparrow (*Passerculus sandwichensis*).
Junco (*Junco hyemalis*).
White-throated sparrow (*Zonotrichia albicollis*).
White-crowned sparrow (*Zonotrichia leucophrys*).
Swamp sparrow (*Melospiza georgiana*).

Song sparrow (*Melospiza melodia*).
Fox sparrow (*Passerella iliaca*).
Lazuli finch (*Cyanospiza amœna*).
Western tanager (*Piranga ludoviciana*).
Purple martin (*Progne subis*).
Cliff swallow (*Petrochelidon lunifrons*).
Barn swallow (*Hirundo erythrogaster*).
Tree swallow (*Iridoprocne bicolor*).
Bank swallow (*Riparia riparia*).
Rough-winged swallow (*Stelgidopteryx serripennis*).
Cedarbird (*Bombycilla cedrorum*).
White-eyed vireo (*Vireo griseus*).
Least vireo (*Vireo pusillus*).
Black and white warbler (*Mniotilta varia*).
Yellow warbler (*Dendroica æstiva*).
Audubon warbler (*Dendroica auduboni*).
Macgillivray warbler (*Oporornis tolmei*).
Maryland yellowthroat (*Geothlypis trichas*).
Yellow-breasted chat (*Icteria virens*).
Wilson warbler (*Wilsonia pusilla*).
Redstart (*Setophaga ruticilla*).
Brown thrasher (*Toxostoma rufum*).
California thrasher (*Toxostoma redivivum*).
Cactus wren (*Heleodytes brunneicapillus couesi*).
Rock wren (*Salpinctes obsoletus*).
Dotted canon wren (*Catherpes mexicanus punctulatus*).
Bewick wren (*Thryomanes bewickii*).
Long-billed marsh wren (*Telmatodytes palustris*).
Plain titmouse (*Bæolophus inornatus*).
Black-capped chickadee (*Penthestes atricapillus*).
Carolina chickadee (*Penthestes carolinensis*).
Mountain chickadee (*Penthestes gambeli*).
Wren tit (*Chamæa fasciata*).
Bush tit (*Psaltriparus minimus*).
Ruby-crowned kinglet (*Regulus calendula*).
Wilson thrush (*Hylocichla fuscescens*).
Russet-backed thrush (*Hylocichla ustulata*).
Swainson thrush (*Hylocichla ustulata swainsoni*).
Alaska hermit thrush (*Hylocichla guttata*).

FUNGOUS ENEMIES.

The prevalence of a fungous disease (*Empusa* sp.) among the larvæ and pupæ of tipulids (*Pachyrhina ferruginea* Fab.) at Farmersburg, Ind., is recorded by Professor Webster. When attacked by this disease the larvæ and pupæ come completely out of the ground, turn black, and die. On October 27 a female *Tipula infuscata* in one of the rearing cages was found dead and covered with a decided fungous growth. The fungus was determined by Mrs. F. W. Patterson, of the Bureau of Plant Industry, as *Sporotrichum densum*, and may prove to be parasitic.

REMEDIAL AND PREVENTIVE MEASURES.

Several remedial measures have been recommended against tipulids in general by different writers, from time to time, among which might be mentioned sprinkling the ground with salt, herding sheep and hogs in infested fields, and rolling the ground with a heavy roller. Probably the best method of treating an infested field is to plow the sod under in the early fall and either to run the field into corn,

potatoes, and such crops, or to leave it fallow the ensuing summer. Pastures and hay fields in localities where this species is known to be abundant should be grazed off by the middle of September and kept so until late in November, as the adult flies usually congregate in rank growths of grass, clover, weeds, etc., and there lay their eggs.

LARVÆ OF CRANE-FLIES AS ACCIDENTAL INHABITANTS OF MAN.

While we have no knowledge that any of our American Tipulidæ directly affect man, in a contribution to The British Medical Journal of February 12, 1910, No. 2563, page 371, Dr. W. Soltau Fenwick, in a contribution under the head of "The existence of living creatures in the stomach as a cause of chronic dyspepsia," cites two instances, as follows: "In two apparently authentic cases (Lasalle, Sentex) larvæ belonging to the family of Tipulidæ or crane-flies were detected in the vomit and fæces. Of this, the best-known species is the *Tipula longicornis*, or daddy-long-legs, which deposits its eggs on the ground, whence they possibly gain access to the human stomach by means of unwashed vegetables and fruit. The grubs, which are tough-skinned and hard-headed, are well known to gardeners by the name of leather jackets."

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